

AMENDMENT TO THE CLAIMS

1. (currently amended) A temperature regulated, enclosed electrical energy storage cell for use in an explosive safe environment, comprising:

an electrical energy storage cell;

a first layer of thermally conductive material that is shaped to conform to a cylindrical portion of an outer surface of the electrical energy storage cell, the first layer terminating at first layer ends that are on the cylindrical portion of the outer surface of the electrical energy storage cell, and the first layer having a first thickness and a first value of thermal conductivity; and

a second layer of thermally insulating material that is shaped to form an enclosure of an outer surface of the first layer and that extends beyond the outer surface to enclose the first layer ends, the second layer defining an exterior surface of the enclosure of the electrical energy storage cell which separates the electrical energy storage cell from the explosive environment, the second layer having a second thickness and a second value of thermal conductivity; and the first and second thicknesses and the first and second values of thermal conductivity conforming the enclosed electrical energy storage cell to a combustible atmosphere temperature classification that specifies an outer surface temperature during an electrical short circuit of the electrical energy storage cell, the enclosure controlling the outer surface temperature of the combined enclosure and electrical energy storage cell such that the temperature regulated, enclosed electrical energy storage cell comprises intrinsically safe equipment in the explosive environment; and

wherein an exterior temperature of the second layer which is exposed to the explosive environment is less than an ignition temperature of the explosive environment during the electrical short circuit of the electrical energy storage cell.

2. (previously presented) The temperature regulated, enclosed electrical energy storage cell of

Claim 1 wherein the electrical energy storage cell produces heat at a hot spot during the short circuit and the first layer of material spreads flow of the heat over a portion of the outer surface of the first layer that is larger than the hot spot and the second layer of material retards flow of the heat to an outer surface of the second layer.

3. (previously presented) The temperature regulated, enclosed electrical energy storage cell of Claim 1 wherein the temperature of the outer surface of the second layer has a measured maximum temperature of 130 degrees centigrade or less during the short circuit condition.

4. (previously presented) The temperature regulated, enclosed electrical energy storage cell of Claim 1 wherein the first layer of material comprises aluminum.

5. (previously presented) The temperature regulated, enclosed electrical energy storage cell of Claim 1 wherein the first layer of material comprises copper.

6. (previously presented) The temperature regulated, enclosed electrical energy storage cell of Claim 1 wherein the second layer of material comprises heat-shrink tubing.

7. (previously presented) The temperature regulated, enclosed electrical energy storage cell of Claim 1 wherein the second layer of material comprises elastic material.

8. (previously presented) The temperature regulated, enclosed electrical energy storage cell of Claim 1 wherein the first layer comprises two thermally conductive half-shells that each enclose one side of a round surface of the energy storage cell.

9. (currently amended) A battery for use in an explosive environment comprising a combustible atmosphere, comprising:

a plurality of electrical energy storage cells that comprise at least one hot spot during a

short circuit, each cell being covered by a first layer of thermally conductive material that has a first thickness and a first value of thermal conductivity and that is shaped to conform to a cylindrical portion of an outer surface of the electrical energy storage cell, the first layer terminating at first layer ends that are on the cylindrical portion of the outer surface of the electrical energy storage cell, the first layer being enclosed by a second layer of thermally insulating material to form a plurality of enclosed cells, the second layer defining an exterior surface which separates the electrical energy storage cells from the explosive environment, the second layer preventing contact between the combustible gas and the first layer, and the second layer being shaped to conform to an outer surface of the first layer, the second layer having a second thickness and a second value of thermal conductivity, and the first and second thicknesses and the first and second values of thermal conductivity conform the battery to a combustible atmosphere temperature classification that specifies an outer surface temperature during an electrical short circuit of the electrical energy storage cell;
a protective device including a fusible link; and
electrical interconnections that interconnect the plurality of electrical energy storage cells in a series circuit with the protective device, the combination of the first and second layers and the protective device rendering the battery intrinsically safe; and
wherein an exterior temperature of the second layer which is exposed to the explosive environment is less than an ignition temperature of the explosive environment when the electrical short circuit is provided across the electrical energy storage cells.

10. (previously presented) The battery of Claim 9 further comprising: a plastic resin shell shaped to receive the plurality of enclosed cells and the protective device.

11. (previously presented) The battery of Claim 10 wherein the plastic resin shell includes plastic

resin separation bars positioned between the enclosed cells and the electrical interconnections to reduce shorting.

12. (cancelled)

13. (cancelled)

14. (cancelled)

15. (cancelled)

16. (cancelled)

17. (cancelled)

18. (cancelled)

19. (cancelled)

20. (cancelled)

21. (cancelled)

22. (cancelled)

23. (cancelled)

24. (currently amended) An apparatus, comprising:

a data acquisition unit in an explosive environment; and

a battery for the data acquisition unit, comprising:

a plurality of electrical energy storage cells that comprise at least one hot spot during a short circuit, each cell being covered by a first layer of thermally conductive material that has a first thickness and a first value of thermal conductivity and that is shaped to conform to a cylindrical portion of an outer surface of the electrical energy storage cell, the first layer terminating at first layer ends that are on the cylindrical portion of the outer surface of the electrical energy storage cell, the first layer being enclosed by a second layer of thermally insulating material to form a plurality of enclosed cells, the second layer defining an exterior surface of an

enclosure of the electrical energy storage cells which separates the electrical energy storage cells from the explosive environment, the second layer preventing contact between the combustible gas and the first layer, and the second layer being shaped to conform to an outer surface of the first layer, the second layer having a second thickness and a second value of thermal conductivity, and the first and second thicknesses and the first and second values of thermal conductivity conform the battery to a combustible atmosphere temperature classification that specifies an outer surface temperature during a short circuit of the electrical energy storage cell;

a protective device including a fusible link; and
electrical interconnections that interconnect the plurality of enclosed cells in a series circuit with the protective device to form an intrinsically safe battery; and

wherein an exterior temperature of the second layer which is exposed to the explosive environment is less than an ignition temperature of the explosive environment during the electrical short circuit of the electrical energy storage cell.

25. (previously presented) The apparatus of Claim 24 wherein the apparatus is portable.

26. (previously presented) The apparatus of Claim 25 wherein the apparatus is handheld.

27. (previously presented) The apparatus of Claim 24 wherein the apparatus is intrinsically safe.

28. (previously presented) The apparatus of Claim 24 wherein the short circuit is external to the battery.

29.(previously presented) The apparatus of Claim 24 wherein the enclosed cells are rechargeable.

30. (currently amended) An apparatus in an explosive environment, comprising:

a calibrator; and

a battery for the calibrator, comprising:

a plurality of electrical energy storage cells that comprise at least one hot spot during a short circuit, each cell being covered by a first layer of thermally conductive material that has a first thickness and a first value of thermal conductivity and that is shaped to conform to a cylindrical portion of an outer surface of the electrical energy storage cell, the first layer terminating at first layer ends that are on the cylindrical portion of the outer surface of the electrical energy storage cell, the first layer being enclosed by a second layer of thermally insulating material to form a plurality of enclosed cells, the second layer defining an exterior surface of an enclosure of the electrical energy storage cells which separates the electrical energy storage cells from the explosive environment, the second layer preventing contact between the combustible gas and the first layer, and the second layer being shaped to conform to an outer surface of the first layer, the second layer having a second thickness and a second value of thermal conductivity, and the first and second thicknesses and the first and second values of thermal conductivity conform the battery to a combustible atmosphere temperature classification that specifies an outer surface temperature during a short circuit of the electrical energy storage cell;

a protective device including a fusible link; and

electrical interconnections that interconnect the plurality of electrical energy storage cells in a series circuit with the protective device to form an intrinsically safe battery; and

wherein an exterior temperature of the second layer which is exposed to the explosive environment is less than an ignition temperature of the explosive environment during the short circuit of the electrical energy storage cell.

31. (previously presented) The apparatus of Claim 30 wherein the apparatus is portable.
32. (previously presented) The apparatus of Claim 31 wherein the apparatus is handheld.
33. (previously presented) The apparatus of Claim 30 wherein the apparatus is intrinsically safe.
34. (previously presented) The apparatus of Claim 30 wherein the short circuit is external to the battery.
35. (previously presented) The apparatus of Claim 30 wherein the enclosed cells are rechargeable.